

## REMARKS

The application stands with claims 25-31, 33, 36-45, 47-70 and 72-94 where claims 25, 49, 74, 84 and 91 are independent. Claims 30, 31, 51, 56 and 57 are withdrawn. Herein, claims 25, 27, 49, 53, 74, 76, 84, and 91 are amended and dependent claims 95-98 are added for reasons explained below.

As a preliminary matter, the Examiner has discussed the use of "whereby" clauses in the previous version of the independent claims. In an effort to claim features more structurally than rather purely functionally, those clauses have been amended in each of the independent claims 25, 49, 74, 84 and 91 by replacing the wording:

*"whereby exposure of the fissile material to a neutron flux causes fission and the release of fission fragments into the chamber to interact with the gas circulating through said chamber"*

with:

*"wherein the fissile material on the front face of the chamber wall is in direct contact with the gas circulating through said chamber".*

Hence, the new wording includes the structural limitation of the direct contact between the fissile coating of the chamber wall and the gas circulating through the chamber. This implies that whenever fission occurs within the fissile fuel, due to exposure to a neutron flux, at least some of the fission fragments will be released into the chamber, thus enabling direct transfer of their kinetic energy to the gaseous medium. Such physical behavior, resulting from the claimed structural features, never appears in the prior art.

### Claim rejections – 35 U.S.C. § 112

In section 6 of the Office Action, claims 25-29, 33, 36-45, 47-50, 52-55, 58-70 and 72-94 stand rejected under 35 U.S.C. §112, 1<sup>st</sup> paragraph, regarding the enablement requirement.

In response, Applicant amended independent claims 25, 49, 74, 84 and 91 to remove the rejected language as discussed above.

Thus, this rejection is now moot. It is now impossible to construe the claims as meaning that the cooling means alone will ensure or result in exposure of the fissile material to a neutron flux. For this reason, Applicant submits that the §112, 1<sup>st</sup> par. rejection of claims 25, 49, 74, 84 and 91, and their depending claims, has been overcome, and respectfully requests the rejection be withdrawn.

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In section 7 of the Office Action, claims 25-29, 33, 36-45, 47-50, 52-55, 58-70 and 72-94 stand rejected under 35 U.S.C. § 112, 2<sup>st</sup> paragraph, as being incomplete for omitting essential elements. Specifically, the Examiner asserts that the omitted elements are specific features that ensure release of fission fragments into the chamber to interact with the circulating gas. In response, Applicant asserts that in the currently amended independent claims 25, 49, 74, 84 and 91, such release mentioned by the Examiner of fission fragments into the chamber is no longer recited, and the claimed structure of the direct contact between the fissile coating and the gas circulating through the chamber covers the specific features the Examiner states are missing. For this reason, Applicant submits that the §112, 1<sup>st</sup> par. rejection of claims 25, 49, 74, 84 and 91, and their depending claims, has been overcome, and respectfully requests the rejection be withdrawn.

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In section 8 of the Office Action, claims 25-29, 33, 36-45, 47-50, 52-55, 58-70 and 72-94 stand rejected under 35 U.S.C. § 112, 2<sup>nd</sup> paragraph, as being indefinite. In response, the objected clauses have been deleted, which makes this rejection moot. For this reason, Applicant submits that the §112, 2<sup>d</sup> par. rejection of claims 25, 49, 74, 84 and 91, and their depending claims, has been overcome, and respectfully requests the rejection be withdrawn.

In addition, the Examiner objected to numerical ranges in claims 27, 53, 76 and 94. In response, each of those claims has been split into two separate claims, with the insertion of claims 95-98 to cover this subject matter with proper scope. For this reason, Applicant respectfully requests that the §112, 2<sup>nd</sup> par. rejection of claims 27, 53, 76 and 94 be withdrawn.

**Claim rejections - 35 U.S.C. § 103**

Claims 25, 26, 28, 29, 33, 36-45, 47-50, 54-56, 58-70, 72-75 and 77-93 have been rejected under 35 U.S.C. § 103(a) as being "unpatentable" over Culver in view of Bingham et al. and Etherington (sections 9 and 11 of the Office Action). In pages 9-10 of the Office Action, the Examiner indicates that the above-discussed "whereby" clauses have not been construed as serving to patentably distinguish the claim structure over the prior art. In response, although the Applicant respectfully disagrees with the Examiner, independent claims 25, 49, 74, 84 and 91 have been amended in an effort to appease the Examiner. Applicant asserts that the cited references do not disclose or suggest direct contact between the fissile material coating and the gaseous medium as now recited in claims 25, 49, 74, 84 and 91.

In particular, the Examiner has acknowledged that the primary reference Culver does not disclose the feature of the chamber walls being coated with fissile material. For the latter feature, the Examiner uses the Bingham et al. reference, which discloses coating americium carbide on a cylinder base material used to manufacture gas-cooled nuclear fuel elements.

It is believed that the Examiner reads the sentence of column 2, lines 53-56 of Bingham et al.'s patent out of context. That sentence mentions the application of the nuclear fuel to the cylinders 12 by coating or impregnating the cylinder material with the desired fuel. This is but one step of Bingham et al.'s manufacturing process which then includes the steps of depositing a protective carbon layer by chemical vapor position and of depositing a final protective layer of zirconium carbide by chemical vapor deposition (column 3, lines 16-19). As explained in Applicant's previous responses, the protective layers thus deposited act to

block the released fission fragments within the bulk of the fuel material. In other words, those protective layers act as a barrier between the fissile material and the medium located in the central bore of the fuel element.

Therefore, even if one skilled in the art would have thought of combining the teachings of Culver and Bingham et al., it would not have been obvious for him to provide the claimed direct contact which provides the physical behavior in the present invention. The cited references simply do not teach, disclose or suggest the claimed direct contact.

Etherington's Nuclear Engineering Handbook appears to have been cited with respect to independent claims 25 which includes limitations regarding the thickness of a neutron reflector used around the chamber. Etherington also fails to suggest the structural feature of the direct contact between the fissile material and the circulating gas. The Etherington reference is not understood to have been opposed to the other independent claims 49, 74, 84 and 91. For these reasons, Applicant submits that the §103 rejection of claims 25, 49, 74, 84 and 91, and their depending claims, has been overcome, and respectfully requests the rejection be withdrawn.

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In section 10 of the Office Action, dependent claims 27, 53, 76 and 94 stand rejected under 35 U.S.C. §103(a) over the Culver-Bingham et al.-Etherington combination and further in view of Chikin et al. Each of these four claims depends on one of the independent claims and therefore includes the features of the independent claims plus other features. Since independent claims 25, 49, 74 and 91 are allowable for the reasons set forth here above, Applicant submits this §103 rejection has also been overcome. Thus, Applicant respectfully requests that the §103 rejection of claims 27, 53, 76 and 94 be withdrawn.

**Conclusion**

For all of the reasons mentioned above, Applicant respectfully requests reconsideration and allowance of all of the pending claims. The Examiner is invited to contact the undersigned attorney to expedite prosecution.

Please charge any deficiency, or credit any overpayment, to Deposit Account No. 18-2284 of Piper Rudnick LLP.

Respectfully submitted,

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